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Please substitute the paragraph beginning at page 58, line 11, with the following. A

marked-up copy of this paragraph, showing the changes made thereto, is attached in Appendix A.

AB3 -- where X is the amount of shift in the optical axis direction from the lens vertex, H is the distance from the optical axis, r_i is the curvature radius, k is the conical constant, and A, B, ..., G are aspherical surface coefficients. --

IN THE CLAIMS: ✓

Please CANCEL claims 4, 6 and 14-16 without prejudice to or disclaimer of the recited subject matter. ✓

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Please AMEND claims 1, 5, 7 and 10-13, and ADD claims 17-46 as follows. A marked-up copy of the amended claims showing the changes made thereto is attached. Note that all the claims currently pending in this application, including those not currently being amended, have been reproduced below for the Examiner's convenience.

AB4 1. (Amended) A projection optical system, comprising:

at least one lens;

at least one concave mirror;

at least one diffractive optical element;

a first imaging optical system, having said at least one lens and said at least one concave mirror, for imaging an intermediate image of an object;

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5/ (Amended) A projection optical system according to Claim 5, wherein said first imaging optical system includes at least a lens having a positive refractive power, a reflection mirror and said concave mirror, which are disposed in the order mentioned above, from the object side.

6/ A projection optical system according to Claim 7, further comprising a lens group disposed between said reflection mirror and said concave mirror.

7/ A projection optical system according to Claim 8, wherein said lens group has a negative refractive power and is disposed between said concave mirror and a lens, in said first imaging optical system, having a positive refractive power.

8/ 10. (Amended) A projection optical system according to Claim 1, further comprising a reflection surface disposed adjacent to an intermediate image formed by said first imaging optical system, and wherein abaxial light from the object as reflected and collected by said concave mirror is deflected by said reflection surface toward said second imaging optical system.

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9/ (Amended) A projection optical system according to any one of Claims 1-3, 5 and 7-10, wherein said at least one of diffractive optical elements of said projection optical system satisfies a relation:

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$$3 < MP/\lambda < 50$$

where MP is a minimum pitch (micron) of the diffractive optical element, and λ is the exposure wavelength (micron).

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10. (Amended) A projection optical system according to any one of Claims 1-3, 5, and 7-10, wherein at least one of diffractive optical elements of said projection optical system satisfies a relation:

$$|L_d/L_{g2}| < 0.2$$

where L_d is the distance between an aperture stop of said second imaging optical system and said diffractive optical element, and L_{g2} is the distance from a paraxial image plane position of an intermediate image formed by said first imaging optical system, corresponding to an object point position of said second imaging optical system, to a re-imaging plane where the intermediate image is re-imaged.

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11. (Amended) A projection optical system according to any one of Claims 3, 4, 5, 7, 8, 9, 10, further comprising a field stop adjacent to an intermediate image to be formed by said first imaging optical system.

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Please ADD new claims 17-46 as follows:

- 17. A projection optical system, comprising:
- at least one lens;
 - at least one concave mirror; and

at least one diffractive optical element,

wherein said at least one diffractive optical element satisfies a relation:

$$3 < MP/\lambda < 50$$

where MP is a minimum pitch (micron) of the diffractive optical element, and λ is the exposure wavelength (micron).

18. A projection optical system according to Claim 17, wherein said at least one lens, said at least one concave mirror and said at least one diffractive optical element have a positive refractive power, respectively, and wherein said projection optical system does not include a lens having a negative refractive power, a mirror having a negative refractive power, a mirror having a negative refractive power or a diffractive optical element having a negative refractive power.

19. A projection optical system according to Claim 17, wherein said at least one lens, said at least one concave mirror and said at least one diffractive optical element include a lens, a concave mirror and a diffractive optical element of a positive refractive power.

20. A projection optical system according to Claim 17, wherein said projection optical system includes a first imaging optical system having said at least one lens and said at least one concave mirror, for imaging an intermediate image of an object, and a second imaging optical system having said at least one lens and at least one diffractive optical element, for projecting the intermediate image onto an image plane.

21. A projection optical system according to Claim 20, wherein said first and second imaging optical systems are disposed along a common straight optical axis, and wherein abaxial light from the object as reflected and collected by said concave mirror is caused by said mirror to pass through an outside portion of an effective diameter of said concave mirror, toward the image plane side.

22. A projection optical system according to Claim 20, further comprising a field optical system disposed between said first and second imaging optical systems.

23. A projection optical system according to Claim 21, wherein said first imaging optical system includes at least a lens having a positive refractive power, a reflection mirror and said concave mirror, which are disposed in the order mentioned above, from the object side.

24. A projection optical system according to Claim 23, further comprising a lens group disposed between said reflection mirror and said concave mirror.

25. A projection optical system according to Claim 24, wherein said lens group has a negative refractive power and is disposed between said concave mirror and a lens, in said first imaging optical system, having a positive refractive power.

26. A projection optical system according to Claim 20, further comprising a reflection surface disposed adjacent to an intermediate image formed by said first imaging optical system, and wherein abaxial light from the object as reflected and collected by said concave mirror is deflected by said reflection surface toward said second imaging optical system.

27. A projection optical system, comprising:

at least one lens;

at least one concave mirror;

at least one diffractive optical element,

wherein said at least one diffractive optical element satisfies a relation:

$$|L_d/L_{g2}| < 0.2$$

where L_d is the distance between an aperture stop of said second imaging optical system and said diffractive optical element, and L_{g2} is the distance from a paraxial image plane position of an intermediate image formed by said first imaging optical system, corresponding to an object point position of said second imaging optical system, to a re-imaging plane where the intermediate image is re-imaged.

28. A projection optical system according to Claim 27, wherein said at least one lens, said at least one concave mirror and said at least one diffractive optical element have a positive refractive power, respectively, and wherein said projection optical system does not include a lens

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having a negative refractive power, a mirror having a negative refractive power, a mirror having a negative refractive power or a diffractive optical element having a negative refractive power.

29. A projection optical system according to Claim 27, wherein said at least one lens, said at least one concave mirror and said at least one diffractive optical element include a lens, a concave mirror and a diffractive optical element of a positive refractive power.

30. A projection optical system according to Claim 27, wherein said optical system includes a first imaging optical system having said at least one lens and said at least one concave mirror, for imaging an intermediate image of an object and a second imaging optical system having said at least one lens and at least one diffractive optical element, for projecting the intermediate image onto an image plane.

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31. A projection optical system according to Claim 30, wherein said first and second imaging optical systems are disposed along a common straight optical axis, and wherein abaxial light from the object as reflected and collected by said concave mirror is caused by said mirror to pass through an outside portion of an effective diameter of said concave mirror, toward the image plane side.

32. A projection optical system according to Claim 30, further comprising a field optical system disposed between said first and second imaging optical systems.

33. A projection optical system according to Claim 31, wherein said first imaging optical system includes at least a lens having a positive refractive power, a reflection mirror and said concave mirror, which are disposed in the order mentioned above, from the object side.

34. A projection optical system according to Claim 33, further comprising a lens group disposed between said reflection mirror and said concave mirror.

35. A projection optical system according to Claim 34, wherein said lens group has a negative refractive power and is disposed between said concave mirror and a lens, in said first imaging optical system, having a positive refractive power.

36. A projection optical system according to Claim 30, further comprising a reflection surface disposed adjacent to an intermediate image formed by said first imaging optical system, and wherein abaxial light from the object as reflected and collected by said concave mirror is deflected by said reflection surface toward said second imaging optical system.

37. A projection optical system, comprising:

at least one lens;

at least one concave mirror;

at least one diffractive optical element;

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a first imaging optical system having said at least one lens and said at least one concave mirror, for imaging an intermediate image of an object, wherein said first imaging optical system includes at least a lens having a positive refractive power, a reflection mirror and said concave mirror, which are disposed in the order mentioned above, from the object side; and

and said at least one
a second imaging optical system having said at least one lens, ~~and at least one~~ diffractive optical element, for projecting the intermediate image onto an image plane,

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wherein said first and second imaging optical systems are disposed along a common straight optical axis, and wherein abaxial light from the object as reflected and collected by said concave mirror is caused by said mirror to pass through an outside portion of an effective diameter of said concave mirror, toward the image plane side.

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A projection optical system according to Claim 37, wherein said at least one lens, said at least one concave mirror and said at least one diffractive optical element have a positive refractive power, respectively, and wherein said projection optical system does not include a lens having a negative refractive power, a mirror having a negative refractive power, a mirror having a negative refractive power or a diffractive optical element having a negative refractive power.

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A projection optical system according to Claim 37, wherein said at least one lens, said at least one concave mirror and said at least one diffractive optical element include a lens, a concave mirror and a diffractive optical element of a positive refractive power.

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15 40. A projection optical system according to Claim 37, further comprising a field optical system disposed between said first and second imaging optical systems.

16 41. A projection optical system according to Claim 37, further comprising a lens group disposed between said reflection mirror and said concave mirror.

17 42. A projection optical system according to Claim 41, wherein said lens group has a negative refractive power and is disposed between said concave mirror and a lens, in said first imaging optical system, having a positive refractive power.

18 43. A projection optical system according to Claim 37, further comprising a reflection surface disposed adjacent to an intermediate image formed by said first imaging optical system, and wherein abaxial light from the object as reflected and collected by said concave mirror is deflected by said reflection surface toward said second imaging optical system.

insert B3 44. A projection optical system according to any one of Claims 37-43, wherein at least one of diffractive optical elements of said projection optical system satisfies a relation:

$$3 < MP/\lambda < 50$$

where MP is a minimum pitch (micron) of the diffractive optical element, and λ is the exposure wavelength (micron).

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45. A projection optical system according to any one of Claim 37-43, wherein at least one of diffractive optical elements of said projection optical system satisfies a relation:

$$|L_d/L_{g2}| < 0.2$$

where L_d is the distance between an aperture stop of said second imaging optical system and said diffractive optical element, and L_{g2} is the distance from a paraxial image plane position of an intermediate image formed by said first imaging optical system, corresponding to an object point position of said second imaging optical system, to a re-imaging plane where the intermediate image is re-imaged.

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46. A projection optical system according to any one of Claims 39-43, further comprising a field stop adjacent to an intermediate image to be formed by said first imaging optical system. --

REMARKS

Applicants request favorable reconsideration and allowance of the subject application in view of the preceding amendments and the following remarks.

To place the subject application in better form, the specification has been amended to correct minor informalities. Also, Applicants submit a new abstract in accordance with preferred practice. No new matter has been added by these changes.